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Interferometric Techniques for Probing Laser-Generated Shocks in Transparent Solids*

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Laser-generated shocks have been investigated for more than two decades and have been attractive for the principal reason that the peak pressures achievable with high intensity pulsed laser systems far exceed the pressures generated with explosive or projectile impact experiments. However, laser-generated shock methods have not demonstrated the level of precision that is necessary for producing high quality equation of state (EOS) data, mainly because of problems with drive beam uniformity, limits on the precision and accuracy of the high speed diagnostics required, and lack of adequate characterization of the shock quality. With the advent of modern drive techniques such as random phase plate smoothing and soft-x-ray drives, it may be possible to produce high quality EOS data with laser drivers. We are developing interferometric techniques to obtain space- and time-resolved characterizations of shock uniformity and shock speed in transparent targets. Our experiments employ a displacement interferometer and a velocity interferometer to examine the shock front propagation in targets irradiated with a random phase plate smoothed beam.

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